DOCUMENT RESUME

ED 196 422 IR 009 026

AUTHOR Brody, Philip J.
TITLE Research on Pictures and Instructional Texts: Difficulties and Directions.
PUB DATE Apr 80
NOTE 15p.: Paper presented at the Annual Convention of the Association for Educational Communications and Technology (Denver, CO, April 21-24, 1980). For complete proceedings of the Research and Theory Division, see IR 008 914.

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Elementary Secondary Education: Higher Education; *Learning: Literature Reviews: *Pictorial Stimuli: *Textbook Research: *Textbooks

ABSTRACT

There are difficulties associated with research to determine the relationship of pictorial illustrations and learning from instructional texts. Although pictorial illustrations are one of the most common components of instructional texts, little has been done to determine how they affect learning from texts. The research associated with this area is characterized by a diversity of purpose, approach, and methodology. Among the most common problems are the utilization of materials, both verbal and pictorial, which are not representative of materials found in instructional texts; an emphasis on how pictures help learning to read rather than how they help learning from reading; a lack of diversity of instructional content; and a general lack of attention to the theoretical aspects of the problem. To gain a more complete understanding of how pictures affect learning from text, it will be necessary to encourage researchers to focus their attention on more immediately practical problems. This may call for the development of a new type of researcher, one who has both traditional research skills and the concerns of the instructional development specialist. Additionally, it will be necessary to focus on pictorial attributes rather than on the entire picture. References are listed. (Author/LLS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

ED196422

RESEARCH ON PICTURES AND INSTRUCTIONAL TEXTS:

DIFFICULTIES AND DIRECTIONS

Philip J. Brody
Assistant Professor, Curriculum and Instruction
Director, Educational Media Laboratory
University of Kansas

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Michael Simonson

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Paper presented to the Annual Meeting,
Association for Educational Communications and Technology
Denver, Colorado, April 21-25, 1980

IR009028

Abstract

Although pictorial illustrations are one of the most common components of instructional texts, little has been done to determine how they affect learning from texts. The research associated with this area is characterized by a diversity of purpose, approach, and methodology. Among the most common problems are the utilization of materials, both verbal and pictorial, which are not representative of materials found in instructional texts, an emphasis on how pictures help learning to read rather than how they help learning from reading, a lack of diversity of instructional content, and a general lack of attention to the theoretical aspects of the problem.

To gain a more complete understanding of how pictures affect learning from text it will be necessary to encourage researchers to focus their attention on more immediately practical problems. This may call for the development of a new type of researcher, one who has both traditional research skills, as well as the concerns of the instructional development specialist. Additionally, it will be necessary to focus on pictorial attributes rather than on the entire picture.

INTRODUCTION

Instructional texts are probably found in more schools than any other type of instructional media. Instructional texts are usually characterized by both written words and symbols as well as various types of pictorial and visual illustrations. Yet, in spite of the fact that there has been considerable research in related areas such as the effect of pictures on learning to read both individual words and passages, surprisingly little is known about the effect of pictures on learning from instructional text. As a matter of fact, the term "instructional text" is often confounded with other types of instructional books. In this paper it will refer only to those books whose primary purpose is to present subject-specific information and techniques, rather than those books, such as basal readers, whose objectives are generally free of the constraints of specific academic subjects.

Unfortunately, once this distinction is made, it becomes quite apparent that research in this area is characterized by a diversity of purpose, approach, and methodology. The following then is an attempt to describe the difficulties associated with research which attempts to determine the relationship of pictorial illustrations and learning from instructional text, and to indicate some directions needed to be taken in order to provide useful results.

Difficulties

One of the major difficulties associated with determining the effect of pictorial illustrations on learning from instructional texts has been a continued emphasis on studying how pictures affect learning to read rather than examining how pictures affect learning from reading. As a result, there are numerous studies of the former type with only rare examples of the latter. The problem then feeds upon itself as evidenced by reviews of research which continue this emphasis. Samuel's (1970) oft cited review, for example, concentrates on the effect of pictures on acquisition of sight vocabulary while paying only slight attention to how they affect comprehension of verbal materials. The few results cited by Samuels which deal with comprehension indicate that pictures do not hinder comprehension; however, even these conclusions are confounded by the fact that the sources cited used materials that were more representative of passages used in training students to learn how to read rather than as subject-specific instructional materials. Conclusions and methodology similar to Samuels were also found in another review of research, Concannon's (1975) analysis of the role of pictures in the reading process.

The use of pictorial stimulus materials which are not representative of those found in instructional text is another common problem in picture-text research. Peeck (1975), while concluding that pictures help increase the amount of information acquired, incorporated

a reading passage into cartoon-like illustrations. Similarly, using young children, Haring and Frye (1979) and Ruch and Levin (1977) based their conclusions on studies which used simplified line drawings rather than the more replete illustrations found in texts. The problem of making generalizations from studies using inappropriate illustrations is also found in studies which used older learners and which do focus on learning from reading. Line drawings which were not representative of those found in texts were used by Royer and Cable (1976); computer generated graphics were used with college students by Rigney and Lutz (1976) who concluded that pictures can help concept acquisition from verbal material.

Just as results are confounded by utlizing pictures not representative of those found in instructional texts, so too are the results confounded by the verbal component of experimental treatments. One such manifestation of this problem is the use of passages which are too short. Rankin and Culhane (1970), for example, used a 250 word passage as the treatment for college students. Similarly, Koenke and Otto (1969) required third and sixth grade students to read passages of only 198 words in length, even though they had probably been exposed to longer passages in instructional texts. The use of verbal materials that are more indicative of basal readers than instructional texts are often found in those experiments which utilize elementary level students. Verbal treatments which use narrative and prose styles of writing rather than the expository style usually found in instructional texts (e.g., Haring & Frye, 1979) are the rule rather than the exception.

Other research variables are similarly suspect. Reading passages and their accompanying pictorial illustrations are often presented in ways which barely resemble the manner in which they are typically used in instructional texts. Presenting stimulus materials by slides (Rohwer & Harris, 1975) only loosely approximates the manner in which instructional texts are read: turning back to review, if allowed, is difficult; psychomotor differences between turning a page and operating a project can confound, as can the perceptual difference between reading project and non-projected images; size and distance of images differ. Similarly, presenting the stimulus materials in a computer assisted instruction format presents an artificial treatment which makes accurate and meaningful interpretation difficult.

The lack of diversity of content presents another example of difficulties encountered when trying to determine how the use of pictures can effect learning from instructional text. For the most part, the content has been based on science and mathematic instruction. Dwyer's (1971) study was based on the functioning of the human heart; passages on heat flow and electrical conductivity were used by Royer and Cable (1976); mathematical concepts were the content of the Rasco, Tennyson, and Boutwell (1975) study. While science and mathematics are certainly valid subjects for instructional inquiry, they represent only a partial, and similar, sample of the content and techniques studied in modern schools. Even at the elementary school level, students are exposed to instructional texts in such diverse areas as language arts, social studies,

health, and communications. While each of these may require learning skills which differ considerably from those needed to master science and/or math, with few exceptions they have been ignored by media research.

Still other conditions abound which increase the difficulty in extracting useful information about the relationship between pictorial illustrations and learning from instructional text. For example, rather than focusing on how pictures influence learning from text, Snowman and Cunningham (1975) had subjects actually draw pictures after reading a pictureless passage. While artificial manipulations such as this may be appropriate for imagery studies, they hardly represent the conditions found in current educational practice.

Another such condition centers on the number of pictures that are found in a reading passage. Whereas texts usually have a limited number of pictures, particularly at more advanced levels, several studies have been used an inordinately large number of pictures. In Dwyer's (1971) study, college students viewed thirty-seven visuals in a 2000 word passage, approximately one visual for every 54 words; in the Rankin and Culhavey (1970) study, subjects viewed seventeen visuals in a 250 word passage, approximately one visual for every fifteen words. Utilization of materials with such low picture/word ratio not only raises serious questions of external validity, but also demonstrates a lack of concern for appropriate pedogogical techniques.

The continued emphasis on the gross media comparison tradition

also makes the identification of information relevant to the relationship between pictures and learning from text more difficult. With few exceptions, the majority of students have examined the pictorial illustrations and reading passages as discrete invariant wholes rather than as units consisting of various attributes. This then leads to the predominance of studies which compare learning from passages that include pictures to passages without pictures. Peeck (1974) compared passages that included cartoon illustrations to passages without such illustrations. A somewhat more complex, but similar, approach was used by Main and Griffiths (1977) who compared various combinations of pictorial, print, and audio stimuli. Similarly, Jahoda et. al. (1976) compared text only, simple line drawings, and a combination of the two. While these studies at least made some attempt to describe the nature of the visuals utilized, other studies failed to mention even this minimal consideration.

As can be seen, the above studies neither compared different pictorial attributes, nor did they compare similar types of visual formats. Instead, they seem to focus on determining if pictures, whatever is meant by the term, help increase learning from text, rather than determining which pictorial components or attributes help learning from instructional text. Although this approach has been criticized with a fair degree of regularity (e.g., Allen, 1971; Salomon & Clark, 1977; Torkelson, 1977), picture-text research has only sporadically followed this advice.

Although there are instances where the effectiveness of pictorial attributes are compared (e.g., Thomas, 1978; Dwyer, 1971)

these studies share certain similarities. First, the basis for comparison is usually the visual's physical and/or perceptual characteristics such as color and fidelity. Second, the theoretical considerations are generally limited to the realism continum, a concept which research has continually suggested has only limited utility as a predictor of learning (Dwyer, 1978, 1972). Third, there has been an emphasis on outcomes dealing with either the transfer and replication of information or attitude change rather than how pictorial attributes affect behavioral outcomes. Fourth, most of the studies which have compared pictorial attributes have attempted to answer questions related to whether or not pictures help increase learning while neglecting more recent conceptualizations (e.g., Levie, 1978) which emphasize how different pictorial attributes affect learning.

Directions

It is quite difficult to determine future trends in picture-text research. While there seems to be an increasing interest in studying the various effects of pictures, there has been a general lack of hard disciplined research on how learning from instructional texts is affected by various types of pictures and pictorial attributes. In addition to some of the difficulties mentioned previously, the research in this area is characterized by one-shot studies, where researchers seem to abandon the area after reporting only one study.

However, it is this general increase in pictorial research which may result in more picture-text studies, for as more individuals be-

come concerned with the effect of pictures on other types of learning there may be a corresponding increase in this neglected area. Additionally, current economic conditions require research to be more applicable to practioners. Since instructional texts are one of the most common forms of instructional media, this trend may result in increased attention to the picture-text relationship. However, the general tendency to resist change may make it necessary to look in other directions for solutions to this and similar problems. A potential source may be the development and legitimazation of a new breed of researchers who, in addition to the traditional research skills, have the background and concerns of the instructional design specialist.

Increasing the number and/or focus of concerned researchers represents only part of the solution, for it is also necessary to examine the effects of pictures on instructional text in a broader context. More attention, for example, needs to be paid to the identification and description of those pictorial attributes being examined, thereby increasing the precision of research. This in turn will enable time and energy to be spent where it will do the most good. On the other hand, a continuation of current research methodologies will only suggest that there is something in some pictures which increase learning from instructional text.

The selection of pictorial attributes studied needs to be expanded from the narrow realism perspective to approaches that will provide more useful and applicable information. While somewhat useful, the realism approach often distracts from utilizing and ex-

amining variables which may be more directly related to the effect of pictures on learning from instructional text. An alternative approach would not examine isolated attributes such as color or fidelity, but would examine variables in terms of their relationship to instructional text. Hartley (1979), for example, suggested that while location of a picture within a passage may have important consequences, it has rarely been studied. Other, similar concerns include the need to determine the optimum number of pictures per passage and the relationship of different types of pictures to different types of content.

Another approach would first determine how pictorial variables function and then compare these functional characteristics to other pictorial and non-pictorial variables which function in a similar manner. For example, if a particular pictorial variable functions as a device which encourages students to review previously read materials, then it can be compared to other non-pictorial variables which function in a similar manner (e.g. questions). Thus, the ability to generalize from other mediums and instructional techniques is increased, resulting in expanded utility of research efforts.

Future research must also begin to pay more attention to how pictures affect instructional outcomes other than those related to the transfer and replication of knowledge. For example, the need for instruction to affect the development of the various internal or mental skills has been suggested by those directly involved with media research (e.g., Levie, 1978) as well as those whose primary concern is in other areas of instruction (e.g., Gagne, 1974).

Perhaps the most prominent advocate of this approach is Salomon (1979), who has not only theorized that various media attributes or symbol systems can affect covert mental behavior, but has also provided some empirical proof to support his contentions. More specifically, he has indicated that the various symbol systems employed by different mediums vary as to the type of mental skills they require the student/receiver to utilize and that these symbol systems can be used to activate these skills in students who already possess them or can supplant the skills in learners who do not. Applying Salomon's conceptions to the picture-text relationship could lead to added precision in the design of instructional text. For example, Brody and Legenza (1980) have suggested that pictures placed after a reading passage can encourage students to review previously read information.

As greater emphasis is placed on individualized instruction and on providing a first class education to an increasingly heteorogeneous population approaches such as these have the potential to profoundly influence instructional materials design.

References

Allen, W. H. Instructional media research: Past, present, and future. AV Communication Review, 1971, 1971, 19, 9-18.

Brody, P. J. and Legenza, A. Can pictorial attributes serve mathemagenic functions? Educational Communication and Technology Journal, 1980, (in press).

Concannon, S. J. Illustrations in books for children: Review of research. The Reading Teacher, 1975, 29, 254-256.

Dwyer, F. M. An experimental evaluation of the instructional effectiveness of black and white and colored illustrations. Didakta Medica, 1971, 3, 96-101.

Dwyer, F. M. A Guide for Improving Visualized Instruction. State College, Pa.: Learning Services, 1972.

Dwyer, F. M. Strategies for Improving Visual Instruction. State College, Pa.: Learning Services, 1978.

Gagne, R. M. and Briggs, L. J. Principles of Instructional Design. New York City: Holt, Rinehart and Winston, 1974.

Hartley, J. Designing Instructional Text. New York City: Nichols, 1979.

Jahoda, G. et. al., Utilization of pictorial information in classroom learning. AV Communication Review, 1976, 24, 195-315.

Koenke, K. and Otto, W. Contribution of pictures to children's comprehension of the main idea in reading. Psychology in the Schools, 1969, 6, 298-302.

Levie, W. H. A prospectus for research on visual literacy. Educational Communication and Technology Journal, 1978, 26, 25-36.

Main, R. E. and Griffiths. Evaluation of audio and pictorial instructional supplements. AV Communication Review, 1977, 25, 167-179.

Peeck, J. Retention of pictorial and verbal content of a text with illustrations. Journal of Educational Psychology, 1974, 66, 880-888.

Rankin, E. F. and Culhane, J. W. One picture worth 1000 words? Reading Improvement, 1970, 7, 37-40.

Rasco, R. W., Rennyson, R. D. and Boutwell, R. C. Imagery instructions and drawings in learning prose. Journal of Educational Psychology, 1975, 67, 188-192.

Rigney, J. W. and Lutz, K. A. Effect of graphic analogies of concepts on chemistry learning and attitude. Journal of Educational Psychology, 1976, 68, 305-311.

Rohwer, W. D. and Harris, W. J. Media effects on prose learning in two populations of children. Journal of Education Psychology, 1975, 67, 651-657.

Royer, J. M. and Cable, G. W. Illustrations, analogies, and facilitative transfer in prose learning. Journal of Educational Psychology, 1976, 68, 205-209.

Ruch, M. D. and Levin, J. R. Pictorial organization versus verbal repetition of children's prose: Evidence for processing differences. AV Communication Review, 1977, 25, 269-280.

Salomon, G. On the future of media research. Educational Communication and Technology Journal, 1978, 26, 37-46.

Salomon, G. Interaction of Media, Cognition, and Learning. San Francisco, Jossey-Bass, 1979.

Salomon, G. and Clark, R. E. Reexamining the methodology of research on media and technology in education. Review of Educational Research, 1977, 47, 99-120.

Samuels, S. J. Effects of pictures on learning to read, comprehension, and attitudes. Review of Educational Research, 1970, 40, 397-407.

Snowman, J. and Cunningham, D. J. A comparison of pictorial and written adjunct aids in learning from text. Journal of Educational Psychology, 1975, 67, 307-311.

Thomas, J. L. The influence of pictorial illustrations with written text and previous achievement to the reading comprehension of fourth grade science students. Journal of Research in Science Teaching, 1978, 15, 401-405.

Torkelson, G. M. AVCR--One quarter century: Evolution of theory and research. AV Communication Review, 1977, 25, 317-358.